

# Upper Middle Miocene Fan 1 Play

## MM9 F1, #1481

### *Textularia* "W" and *Bigenerina* 2

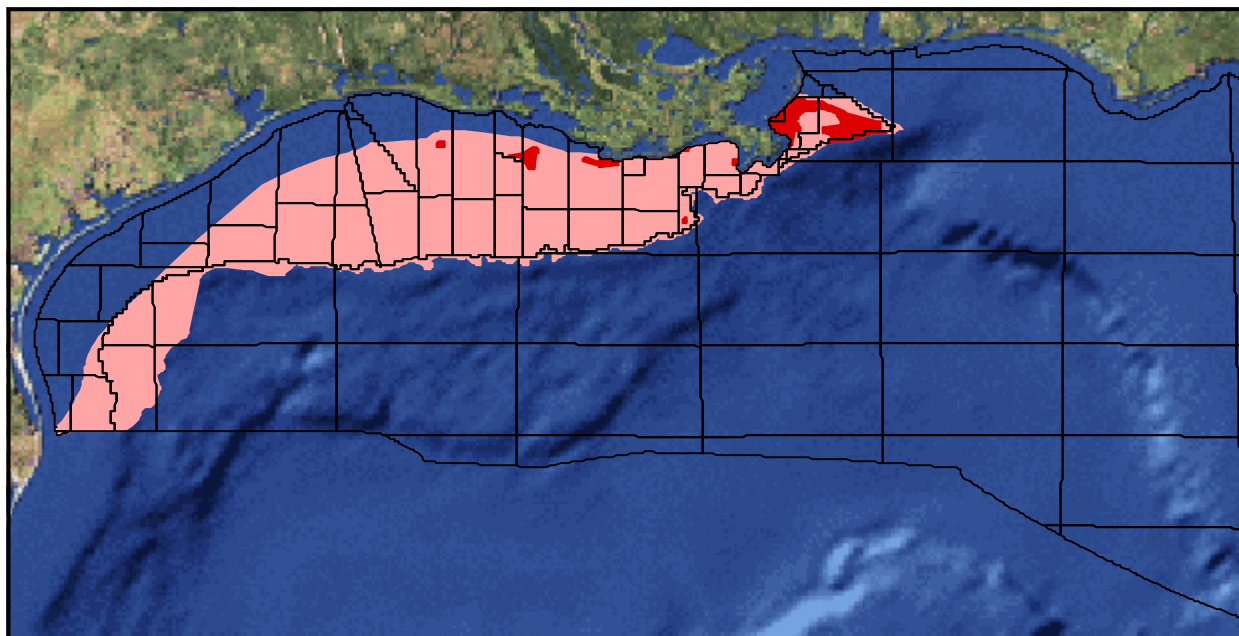


Figure 260. MM9 F1 map showing location of play. Play limit shown in light red; hydrocarbon limit shown in dark red.

## Overview

The Upper Middle Miocene Fan 1 Play (MM9 F1) contains reserves of 875.842 Bcfg and 161.463 MMbo (317.307 MMBOE) in 63 sands in 27 fields. Comparing the 15 F1 fan plays in the GOM, MM9 F1 ranks third in oil reserves (9%). The play extends continuously from the South Padre Island to Destin Dome Area ([Figure 260](#)).

## Description

MM9 F1 is defined by (1) a deep-sea fan depositional style representing sediments deposited basinward of the shelf edges associated with the MM9 Chronozone, (2) an extensional structural regime with salt-withdrawal basins and extensive listric, growth faulting rooting into salt detachments on the modern GOM shelf, and (3) the MM-8 and MM-9 Chronozones, the tops of which are defined by the *Textularia* "W" and *Bigenerina* 2 biozones, respectively ([Figure 8](#)).

MM9 F1 extends continuously from the South Padre Island Area offshore Texas, along and updip from the modern GOM shelf edge to the west-cen-

tral Destin Dome Area east of the modern Mississippi River Delta ([Figure 260](#)). Hydrocarbons have been found in discontinuous clusters from the South Marsh Island to Main Pass Area.

Depositional systems in MM9 time were similar to those of middle lower Miocene (MM7) time. The South Brazos Delta System (Morton et al., 1985) was the dominant supplier of clastics to the Texas offshore and the ancestral Mississippi River Delta System to the Louisiana offshore. Only those sands deposited by the ancestral Mississippi River Delta System are productive in the play.

No significant lateral shift occurs from MM7 deep-sea fan deposits to those of MM9 time. However, the shelf edge west of the north-central Ship Shoal Area shows a basinward shift from MM7 to MM9 time, indicative of the prograding nature of the ancient delta systems.

## Play Limits

MM9 F1 extends onshore in an updip direction, except from the South Padre Island to Ship Shoal Area. Here, the play is limited by the MM-8 shelf edge, the farthest updip shelf edge associated with

the MM9 Chronozone, and grades into the sediments of the Upper Middle Miocene Progradational Play (MM9 P1). To the northeast, MM9 F1 is limited by the deposits of the Upper Middle Miocene Aggradational/Progradational Play (MM9 AP1) overlying the lower Cretaceous carbonate shelf. To the southwest, MM9 F1 extends into Mexican national waters. Down dip, MM9 F1 is limited by the Upper Middle Miocene Fan 2 Play (MM9 F2).

## Depositional Style

MM9 F1 is characterized by deep-sea fan systems deposited basinward of the MM-8 shelf edge. Component facies include channel/levee complexes, sheet-sand lobes, interlobe/fringe sediments, and slump sediments that were deposited on the MM-8 and MM-9 upper and lower slopes, in topographically low areas between salt structure highs, and abyssal plains. These deep-sea fan systems are often overlain by thick shale intervals representative of zones of sand bypass on the shelf, or sand-poor zones on the slope.

The MM9 deep-sea fan interval varies from approximately 100 to more than 9,000 ft in thickness, with net sand thicknesses as much as approximately 1,000 ft. Individual sands range from a few tens of feet to approximately 100 ft in thickness. Sand-dominated successions comprising deposits of multiple sheet-sand lobes can be as much as 1,000 ft thick, with intervening shale sequences reaching as much as several thousands of feet in thickness. Thick, upward-coarsening and upward-fining log patterns of sand-dominated intervals represent sheet-sand lobe progradation and channel fill/abandonment, respectively, in proximal-fan areas. Irregularly stratified sand successions displaying spiky log patterns suggest deposition in distal-fan areas.

## Structural Style

Many of the fields in MM9 F1 are associated with anticlines; hydrocarbon accumulations trapped by permeability barriers and updip pinchouts or facies changes; and salt diapirs—shallow, intermediate, and deep depths—with hydrocarbons trapped on diapir flanks or in sediments draped over diapir tops. Less common structures include normal faults and growth fault anticlines.

## Quantitative Attributes

On the basis of reserves calculations, MM9 F1 is 51% oil and 49% gas. The 63 sands in the play comprise 103 reservoirs, of which 71 are nonassociated gas, 26 are undersaturated oil, and 6 are saturated oil. Proved reserves are estimated at 872.673 Bcfg and 161.268 MMbo (316.548 MMBOE) in 59 sands in 23 fields ([Table 123](#)). Unproved reserves are estimated at 3.168 Bcfg and 0.195 MMbo (0.759 MMBOE) in 4 sands in 4 fields. These proved plus unproved reserves account for 17% of the reserves for the MM9 Chronozone.

	No. of Sands	Oil (MMbbl)	Gas (Bcf)	BOE (MMbbl)
Proved	59	161.268	872.673	316.548
Cum. production	50	147.807	620.027	258.132
Remaining proved	40	13.461	252.646	58.415
Unproved	4	0.195	3.168	0.759

Table 123. MM9 F1 reserves and cumulative production.

Cumulative production from MM9 F1 totals 620.027 Bcfg and 147.807 MMbo (258.132 MMBOE) from 50 sands in 20 fields. MM9 F1 production accounts for 19% of the MM9 Chronozone's total production. Remaining proved reserves in the play are 252.646 Bcfg and 13.461 MMbo (58.415 MMBOE) in 40 sands in 18 fields.

[Table 124](#) summarizes that water depths of the fields in MM9 F1 range from 15-399 ft, and play interval discovery depths vary from 7,015-18,461 ft, subsea. Additionally, porosity and water saturation range from 18-32% and 19-61%, respectively.

63 Sands	Min	Mean	Max
Water depth (ft)	15	155	399
Subsea depth (ft)	7,015	10,873	18,461
Reservoirs per sand	1	2	4
Porosity	18%	26%	32%
Water saturation	19%	36%	61%

Table 124. MM9 F1 sand attributes. Values are volume-weighted averages of individual reservoir attributes.

## Exploration History

MM9 F1 has a 36-year history of discoveries ([Figure 261](#)). The first four sands in the play were discovered in 1963 in the Main Pass 41 Field, adding the maximum yearly reserves of 183.127 MMBOE. In fact, the largest sand in the play was discovered in 1963 in this field and is estimated to contain 124.394 MMBOE (Figure 4). It wasn't until

1976 that sands were discovered in a field other than Main Pass 41. No other sand containing more than 50 MMBOE has been discovered.

The maximum number of sands discovered in any year occurred in 1996 with 11 sands from six fields (Figure 262). In fact, since the first Atlas database cutoff of January 1, 1995, over half of the play's sands have been discovered, the largest of which is estimated to contain 9.656 MMBOE. The mean sand size for the play is 5.037 MMBOE.

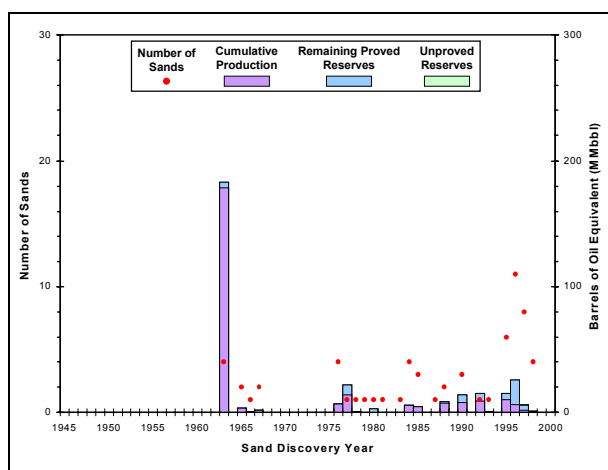


Figure 261. MM9 F1 exploration history graph showing reserves and number of sands discovered by year.

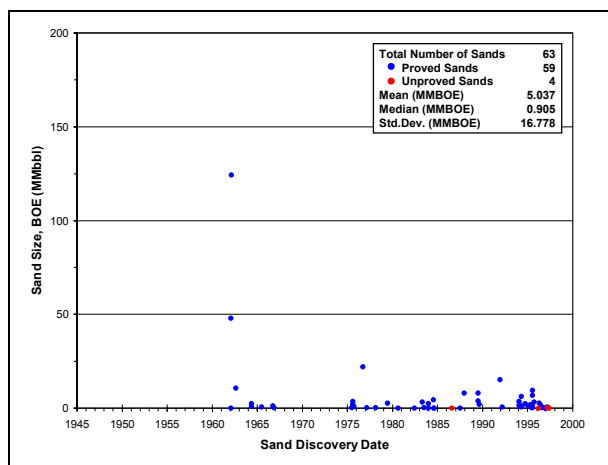


Figure 262. MM9 F1 sand discovery graph showing the size of sands discovered by year.

## Production History

MM9 F1 also has a 36-year history of production (Figure 263). Oil and gas production began in 1963. Oil production quickly reached its yearly peak in 1970. Yearly oil production values sharply declined throughout the 1970's, and have since leveled off at values around 10% of the peak 1970 value. Gas production also reached a peak in 1970 and subsequently declined. However, with almost half of the sand discoveries occurring since 1994, gas production has increased sharply during this same time period to reach its highest yearly level in 1998.

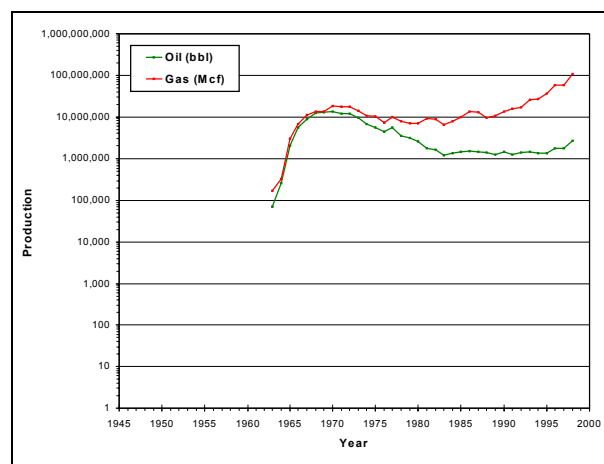


Figure 263. MM9 F1 production graph showing oil and gas production by year.